

REMARKS

Claims 1-31 are pending in the application. Claims 1, 4, 5, 8, 9, 12, 14, 18-22, 24, and 28-30 have been amended.

Claim 31 is provisionally rejected for same invention double patenting with regard to claim 27 of copending application serial number 09/934,759. Claims 1-30 are provisionally rejected for obviousness-type double patenting over claims 1-26 and 28-57 of copending application serial number 09/934,759. The solution to the double patenting rejections may be to abandon the '759 application once the present claims are otherwise indicated to be allowable, so that the filing of a terminal disclaimer is not necessary. A final decision on this has not been made, and no curative response is presently required due to the provisional nature of these rejections.

Claims 1-31 are objected to under 35 U.S.C. §112, first paragraph (page 4 of the office action dated March 19, 2003). The claims recite a Tyler mesh size of 8 to 48, whereas the specification discloses a size of 8 to 45. Paragraphs [0016] and [0046] have been amended to recite the range ending in 48. Additionally, paragraph [0016] has been amended to recite the features of claim 13, which recites a Tyler mesh size of from 10 to 45. It is not new matter to amend the specification for inclusion of matter originally claimed because the originally filed claims constitute part of the original disclosure. *In re Benno*, 226 USPQ 683, 686-687 (Fed Cir. 1985).

Claims 18 and 48 are objected to for typographical errors including "sectionto" and "reasorbtion." Amendments to claims 18 and 48 correct these misspellings.

Claims 1-29 are rejected under 35 U.S.C. §112, second paragraph. Claim 1 has been amended to delete "suitably," and "acceptable" in each instance. The phrase "the same if more than one adsorber vessel"(claim 1) has been deleted, as have the words "significant" (claim1), "significantly" (claims 1 and 28), "sufficient" (claims1 and 30), "sufficiently" (claims 1 and 4), "preferably" (claims 1 and 5), "suitable" (claims 1, 4, 14, 19 and 28), "may be" (claim 12), "possible" (claims8, 9, 19, and 20), "such as" (claims 9, 19, 21, 22, and 29) and "any copper strip or doctor test" (claim 21). These amendments address and overcome the §112 rejection.

Claims 1-3, 5, 10, 12-15, 17-19, 21-23, and 28-31 stand rejected under 35 U.S.C. §103, applying United States Patent No. 5,730,860 issued to Irvine in view of United States Patent No. 5,474,671 issued to O' Connor. Applicant respectfully traverses this rejection because the patents are improperly combined and do not teach or suggest the features of at least claims 1, 30 and 31. These claims recite the use of adsorbent having a Tyler mesh size of from 8 to 48, where the adsorbent is size-segregated to provide no more than 10% bed expansion under the fluidized bed performance conditions. The advantage of limiting bed expansion to no more than 10% increases the adsorbent particle size range that may be used to a range of from 8 to 48 Tyler mesh, provided the adsorbent is size-segregated in this range to effectuate the 10% bed expansion limit. This advantageously facilitates use of commercially produced adsorbents, which are not widely produced in the size ranges disclosed by Irvine '860. Irvine '860 and O'Connor '671 do not teach or suggest these features of claims 1, 30 and 31.

The office action dated March 19, 2003 alleges that the '860 patent teaches everything which is recited in the §103-rejected claims, except for the mesh size of 8 to 48 Tyler mesh. That is an incorrect assumption because it ignores the interplay between particle size range and bed expansion in expanding the useful range of adsorbent particles. O'Connor '671 is merely used to show a fixed bed of activated carbon particles having a Tyler mesh size that falls partially within the claimed range of from 8 to 48 Tyler mesh. While the 8% to 16% bed expansion range described in Irvine '860 partially overlaps with the claimed 10% bed expansion limit, nothing in the combination of O'Connor '671 and Irvine '860 teaches or suggests that particles in the 8 to 48 Tyler mesh range may be size-segregated to effectuate no more than 10% bed expansion while still being useful for impurity removal under fluidized bed conditions. The following comparison clarifies that, by limiting particle size-segregation to produce bed expansion of less than about 10% under the fluidized performance conditions, a wider range of adsorbent sizes may be utilized:

- Irvine '860: 400 to 1600 μm with bed expansion of 8% to 16% (40 to 50 US mesh or 420 μm to 297 μm is preferred; C.6 L.55-56),

- O'Connor '671: 4X14 (4750 μm to 1180 μm) to 20X50 (850 μm to about 290 μm) Tyler mesh with no fluidized bed for expansion (C6 L3-5); and
- Present claims 1, 30, 31: 8 to 48 Tyler mesh (2360 to 300 μm) with 10% or less bed expansion .

A *prima facie* §103 combination of references must show each and every feature of the rejected claims. That is not presently the case. Nothing in the combination of Irvine '860 with O'Connor '761 teaches or suggests that the range of useful particle sizes may be expanded by using size-segregation in combination with imposing a 10% bed expansion limit under the fluidized performance conditions. In particular, O'Connor '671 describes the particle sizes for fixed beds only, not the presently claimed use of fluidized beds. O'Connor does mention the possible use of fluidized beds (C3 L. 61-67), but fixed beds are preferred therein and, in context, the text disclosing particle sizes references fixed bed particles. Even if the particle size passage is interpreted as applying to fluidized beds, both references are completely silent as to limiting bed expansion to no more than about 10% in combination with the claimed particle size range.

It is error to apply the fixed bed particle sizes disclosed by O'Connor '671 to the present claims in context of fluidized performance. If O'Connor '671 were combined with Irvine '860, it would be to substitute the fluidized bed of Irvine '860 with the O'Connor '671 fixed bed, not a fluidized bed as presently claimed. The combination of Irvine '860 with O'Connor '671 teaches away from the claimed method because the O'Connor adsorbent particle sizes are used in a preferred fixed bed. Since particle size is a relevant factor in fluidized bed technology, it would not do to substitute a particle size distribution from O'Connor's fixed bed for use in Irvine's fluidized bed. Furthermore, if the O'Connor '671 particles were used in the Irvine '860 fluidized bed, it would alter the fluidized bed performance disclosed by O'Connor. The O'Connor '671 particle sizes pertain to nonanalogous fixed-bed art that cannot be properly combined with the fluidized bed of Irvine '860.

For the reasons explained above, namely, that the combination of applied references is improperly made and, further, does not teach or suggest the use of 8 to 48 Tyler mesh particles in a fluidized bed having less than about 10% bed expansion, and O'Connor '671 is not a proper reference, Applicant's attorney respectfully submits that claims 1, 30, and 31 are allowable over Irvine '860 and O'Connor '671.

Amended claim 1 is further allowable because it also addresses the concept of regenerating the adsorbent in a plurality of desorption zones where liquids from the respective desorption zones are heated to successively higher temperatures, with condensed liquid from at least one of the desorption zones having fewer impurities than does the fresh feed and effluent from the final desorption zone being a concentrated impurity stream. More particularly, as supported for example in paragraphs 24-25, 34, and 71-75, claim 1 now recites:

providing the regeneration section with two or more desorption zones which first continuously desorb a ~~significant~~ portion of the desired liquid product initially in spent adsorbent pores of the adsorbent at successively higher temperatures in the respective desorption zones, by recirculating gas after cooling and condensing most of the liquid released in the respective desorption zones, with impurity concentration of condensed liquid from at least one of the desorption zones being lower than that of the fresh feed, desorption in the respective zones being accomplished by stripping and heating with this recirculated gas with ~~suitable~~ makeup gas to a higher temperature than the solids leaving a recycle liquid desorption zone, but ~~significantly~~ lower in temperature than that used for heated gas that enters a final desorption zone and which ~~sufficiently~~ removes the impurities from the solids as a concentrated impurity stream.

According to these principles, by way of example, condensed liquid output from desorption zone 176 and separator 200 may now be resubmitted to the upper stages of the adsorber vessel—advantageously improving the octane quality of the treated adsorber vessel effluent. Additionally, the foregoing passage recites “recirculating gas” through the desorber after cooling and condensation. This passage compares to Irvine '860 in that the off gas 400 ('860 Fig. 1.B) is cooled but not condensed, and is disadvantageously lost to downstream hydrogen-consuming processes.

The claimed formation of condensed liquid from separate desorption zones is a significant improvement with respect to Irvine '860, together with the claimed recycling

of desorber gas. The respective liquids adsorbed from the feedstock have a hierarchical affinity for the adsorbent that is not disclosed or suggested in the '860 patent. Successively higher temperatures are required to desorb adsorbent-bound materials including olefins and monoaromatics, then heteroatoms. As claimed, the present method delivers different flow streams from the desorber including one having a lower concentration of impurities than does the feedstock and another having a concentrated stream of impurities. In particular, the olefins add volume and octane content if the olefins are recycled to the feedstock. The claimed condensation of desorber zone effluent makes possible, for example, claim 4 (hydrogenation of recycled dienes) and claims 10-11 (adsorber reinjection of recycle liquid and diene removal prior to adsorber injection). In the method of claim 1, desorber gas output is also recycled continuously, as opposed to being submitted to downstream processes in the '806 patent, so the recycled hydrogen is not lost and makeup gas make not require hydrogen.

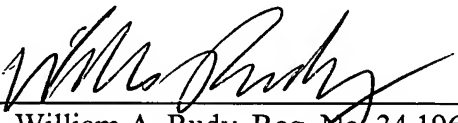
Comparing the '860 patent disclosure to the present claims, off gas 400 includes desorbed olefin, heteroatom and monoaromatic vapor from the regenerating adsorbent, and is lost to downstream processes as hydrogen makeup gas (C10 L. 39-42 of the '860 patent). This loss disadvantageously strips the feedstock of valuable olefins and monoaromatics. Furthermore, where hydrogen is used through the Irvine '860 desorber, process hydrogen requirements are greater where the hydrogen off gas 400 is lost to downstream hydrogen consuming processes, as opposed to being recycled according to claim 1.

Amended claim 1 is allowable for the reasons explained above. Claims 2-29 are likewise allowable, at least because they depend from claim 1. It is also the case that certain dependant claims were not rejected under the combination of Irvine '860 with O'Connor '671, including claim 4 (hydrogenation of recycled dienes), claims 6-9 (hydrogenation of concentrated heteroatoms using hydrogen process gas), claim 11 (diene removal prior to adsorber injection of recycle liquid), claim 16 (adsorber bed height), claim 20 (use of degraded adsorber fines to filter fresh feed for poison), and claims 24-27 (adsorber stage transfer triggered by nuclear measurements). Furthermore, claim 28 recites a more efficient cross-flow arrangement, which permits the use of fewer

heat exchangers and is not taught or suggested in the combination of Irvine '860 with 'O'Connor '671.

Applicant's attorney respectfully solicits a Notice of Allowance in this application. Applicant's attorney believes that no additional fees are due, but the Commissioner is authorized to charge any additionally required fees to deposit account 06-1200. Applicant's attorney urges Examiner Cintins to telephone if a conversation could expedite prosecution.

Respectfully submitted,

By: 
William A. Rudy, Reg. No. 34,196
LATHROP & GAGE L.C.
2345 Grand Boulevard, Suite 2400
Kansas City, MO 64108
Telephone: (816) 460-5819
Facsimile: (816) 292-2001